Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 17 (2): 719–722
https://doi.org/10.15560/17.2.719

PENSOFT

First report of *Atherigona reversura* Villeneuve, 1936 (Diptera, Muscidae) in Uruguay

Mónica Remedios-De León[1], Luciano Damián Patitucci[2, 3], Enrique Morelli[1]

1 Sección Entomología, Facultad de Ciencias, Montevideo, Uruguay • MRDL: mremedios@fcien.edu.uy • EM: emorelli@fcien.edu.uy
2 Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Buenos Aires, Argentina • lpatitu@yahoo.com.ar
3 Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina
* Corresponding author

Abstract
We present the first record of *Atherigona reversura* Villeneuve, 1936 in Uruguay, from Pando, Canelones department a rural area used for livestock. *Atherigona reversura*, this muscid, commonly known as shoot-fly, is a significant pest of cereal crops throughout the Old World tropics and subtropics and its main host is Bermudagrass, *Cynodon dactylon* L.Pers., an exotic species which is widely distributed in South America and in Uruguay and has economic value as forage for livestock and is damaged by the feeding of *A. reversura* larvae.

Keywords
Bermudagrass Stem Maggot, crop pest, *Cynodon dactylon*, distribution

Academic editor: Alessandre Pereira-Colavite | Received 3 December 2020 | Accepted 15 April 2021 | Published 30 April 2021

Citation: Remedios-De León M, Patitucci Luciano D, Morelli E (2021) First report of *Atherigona reversura* Villeneuve, 1936 (Diptera, Muscidae) in Uruguay. Check List 17 (2): 719–722. https://doi.org/10.15560/17.2.719

Introduction

The large muscid genus *Atherigona* Rondani, 1856 (Diptera, Muscidae), commonly known as shoot-flies, includes over 230 species, most of which are found in tropical and subtropical regions (Ribeiro et al. 2016). These flies are significant pests of cereal crops and are often the cause economic loss in agriculture (Pont and Magpayo 1995). The genus is divided into two subgenera: *Acritochaeta* Grimshaw, 1901, which contains mostly saprophagous species, and *Atherigona*, whose phytophagous larvae feed on a variety of wild and cultivated grasses (Skidmore 1985; Pont and Magpayo 1995; Savage 2016). Species of *Atherigona* are known pests of sorghum, rice, wheat, corn, and barley in the Oriental region (Pont and Magpayo 1995; McCullers 2012). In the Americas, only two introduced species are present: *Atherigona* (*Acritochaeta*) *orientalis* Schiner, 1868, with a distributional range from the southern USA to northeastern Argentina (de Carvalho et al. 2005), and *A.* (*Atherigona*) *reversura* Villeneuve, 1936, recently recorded from the North American continent (Hudson 2010) to South America (Patitucci et al. 2016; Ribeiro et al. 2016). In 2010, extensive damage to bermudagrass fields was observed in Georgia, Florida, South Carolina, and Alabama (Hudson 2010). Additional reports from California and northern Mexico were confirmed in 2013, and now *A. reversura* (Bermudagrass Stem Maggot) can be found throughout much of the southeastern and south-central USA (McCullers 2012; Grzywacz et

©The authors. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

al. 2013). In South America, the first occurrence of *A. reversura* in Argentina was recorded in Santa Isabel (Santa Fé) in December 2014, followed by almost simultaneous records in the provinces of Buenos Aires (April and May 2015) and Chaco (March 2015) (Patitucci et al. 2016). In Brazil, *A. reversura* larvae were found in April 2015 in three localities in the western region of the state of Santa Catarina in southern Brazil: Abelardo Luz, Palmitos, and Videira (Ribeiro et al. 2016). This species breeds mainly in Bermudagrass, *Cynodon dactylon* (L.) Pers., although other host species of Poaceae have been reported, including crops such as *Echinochloa colona* (L.) Link, *Eleusine coracana* Gaertn., *Eriochloa procera* (Retz.) C.E.Hubb., *Sehima nervosum* (Rottl.) Stapf., *Sorghum bicolor* (L.) Moench, and *Zea mays* L. (Pont and Magpayo 1995). In tropical and subtropical regions, *Cynodon* grasses are very productive, adaptable to regional soil conditions, pest and disease tolerant, and therefore of great forage potential (Oliveira et al. 2000; Rodrigues et al. 2006). *Cynodon dactylon* has been introduced to all tropical and subtropical areas and is now common in grasslands, lawns, pastures, roadsides, sea-coast sandy dunes, irrigated land, and along rivers (Heuzé et al. 2015).. The presence of this weed makes it difficult for the preparation of sowings; it decreases crop yields, the quality of forage, and the persistence of sown grasslands (Pravia 2009). Damage to *C. dactylon* by larvae of *A. reversura* is frequently mistaken with stress, nutrient deficiency, Bermudagrass leaf spot, and leaf rust, which can result in discolored plant material (Baxter et al. 2014). The immature stages of *A. reversura* were described by Grzywacz et al. (2013). Eggs are deposited on leaves or stems, and feeding by the larvae results in the death of the top two or three leaves which become chlorotic and die, turning white or brown (Baxter et al. 2014; Knutson and Forrest 2019). Mature larvae are cream-colored and about 3 mm in length, and pupation occurs on the soil surface (Baxter et al. 2014). Many details of the life cycle of *A. reversura* have yet to be reported (Knutson and Forrest 2019). We report the first records of *A. reversura* in Uruguay.

Methods

We collected *Atherigona reversura* in Pando, Canelones (Fig. 1), a rural area used for livestock, where the predominant vegetation is *C. dactylon* and small native trees, *Celtis tala* Gillet ex Planch. and *Schinus longifolia* (Lindl.) Speg. The average temperature in summer varies between 18 and 32 °C and in winter between 0 and 20 °C. Specimens were collected during the summer and winter seasons of 2018 and 2019 with van Someren-Rydon canopy traps prepared with chicken liver and banana. Four traps were placed: two in the shade and two in the sun, 50 m apart and 1 m above the ground. The traps were active for 48 hours. The specimens

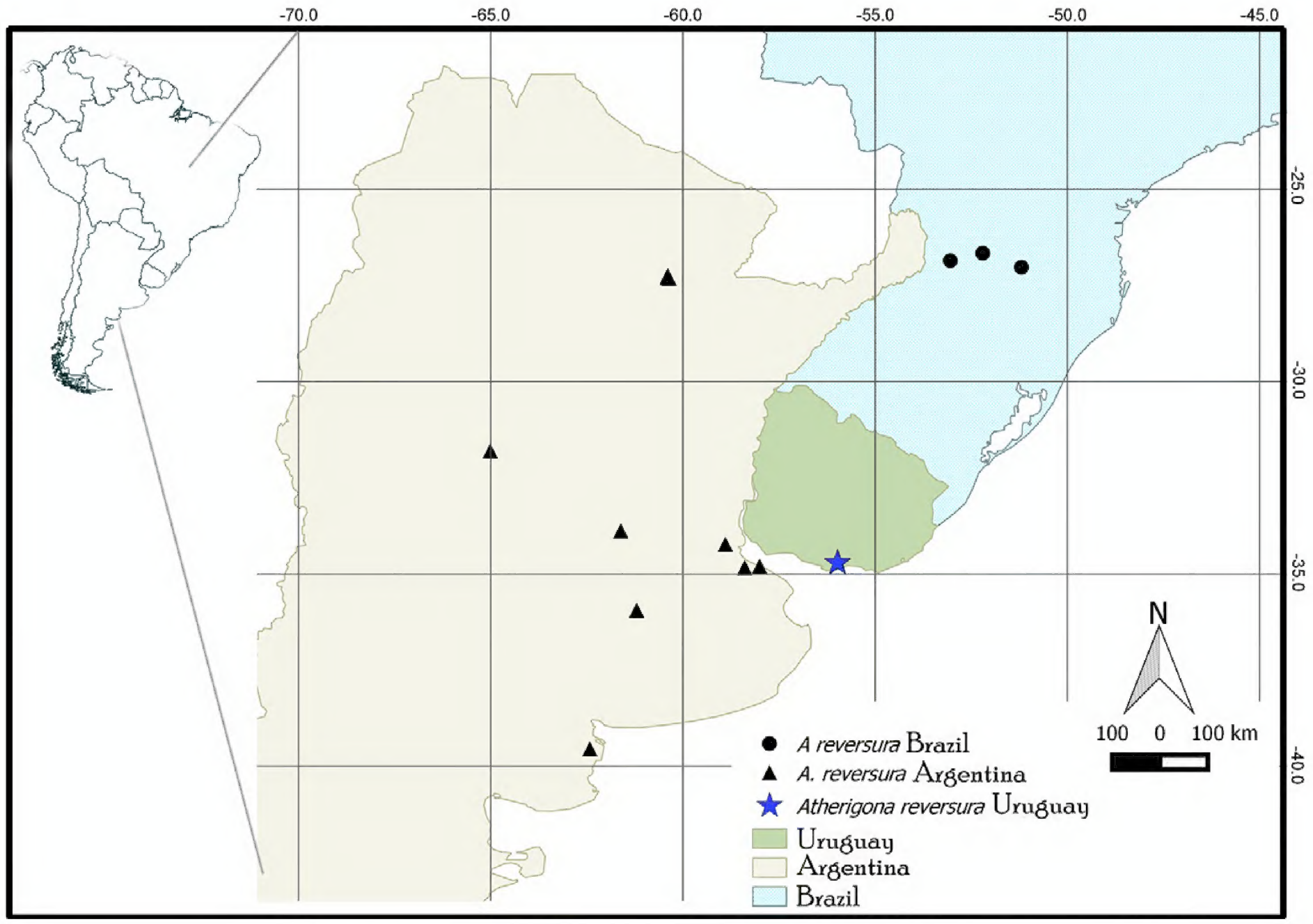

Figure 1. Geographic distribution of *Atherigona reversura* in Uruguay, Argentina, and Brazil. Blue star = new record in Uruguay. Information on the previous records are listed in Table 1.

Table 1. Known records of *A. reversura* in Uruguay, Argentina, and Brazil.

Country	Province	Location	Latitude	Longitude	Source
Uruguay	Canelones	Pando	−34.7091	−055.9746	New record
Argentina	Buenos Aires	Villarino	−39.5434	−062.4244	Patitucci obs. pers
	Buenos Aires	Ensenada	−34.7996	−058.0074	Patitucci obs. pers
	Buenos Aires	—	−35.9440	−061.2048	Patitucci obs. pers.
	Buenos Aires	Burzaco	−34.8313	−058.3950	Patitucci et al. 2016
	Buenos Aires	Campana	−34.2253	−058.8988	Patitucci et al. 2016
	Santa Fé	Santa Isabel	−33.8794	−061.6206	Patitucci et al. 2016
	Córdoba	San Andrés	−31.8003	−065.0136	Patitucci obs. pers.
	Chaco	Villa Berthet	−27.2482	−060.3943	Patitucci et al. 2016
	Chaco	Villa Berthet	−27.3089	−060.3650	Patitucci et al. 2016
	Chaco	Villa Berthet	−27.2903	−060.4174	Patitucci et al. 2016
Brazil	Santa Catarina	Abelardo Luz	−26.6561	−052.2047	Ribeiro et al. 2016
	Santa Catarina	Palmitos	−27.0719	−053.1599	Ribeiro et al. 2016
	Santa Catarina	Videira	−27.0230	−051.1980	Ribeiro et al. 2016

collected were identified using the description by Villeneuve (1936) (Pont and Magpayo,1995). The terminology used for the external morphology follows Cumming and Wood (2017).

Results

Atherigona reversura Villeneuve, 1936

Figures 2, 3

New records. URUGUAY • Canelones department, Pando; −34.7091, −055.9746; 25 m a.s.l.; 17 May 2018; M. Remedios-De León leg.; meat trap in shade; 001FCD, 2 ♂ • Canelones department, Pando; −34.7091, −055.9746; 25 m a.s.l.; 17 May 2018; M. Remedios-De León leg.; meat trap in sun; 002FCD, 1 ♀ • Canelones department, Pando; −34.7091, −055.9746; 25 m a.s.l.; 23 Dec. 2018; M. Remedios-De León leg.; banana trap in sun; 003FCD, 1 ♀ · Canelones department, Pando; −34.7091, −055.9746; 25 m a.s.l.; 24 Feb. 2019; M. Remedios-De León leg.; meat trap in sun; 004FCD, 5 ♂ • Canelones department, Pando; −34.7091, −55.9746; 25 m a.s.l.; 24 Feb. 2019; M. Remedios-De León leg.; meat trap in sun; 005FCD, 8 ♀ • Canelones department, Pando; −34.7091, −055.9746; 25 m a.s.l.; 24 Feb. 2019; M. Remedios-De León leg.; meat trap in shade; 006FCD, 1 ♂ • Canelones department, Pando; −34.7091, −055.9746; 25 m a.s.l.; 16 Mar. 2019; M. Remedios-De León leg.; banana trap in sun; 007FCD, 1 ♂ • Canelones department, Pando; −34.7091, −055.9746; 25 m a.s.l.; 16 Mar. 2019; M. Remedios-De León leg.; sun banana trap; 008FCD, 4 ♀.

Identification. Specimens were identified using taxonomic keys and descriptions provided by Pont and Magpayo (1995). To verify the identification, the male terminalia were compared with the literature (Pont and Magpayo 1995) and specimens collected in Argentina by Dr Patitucci and housed in the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina.

Atherigona reversura (Fig. 2) is distinguished from other muscids due to their small size (3–5 mm), have

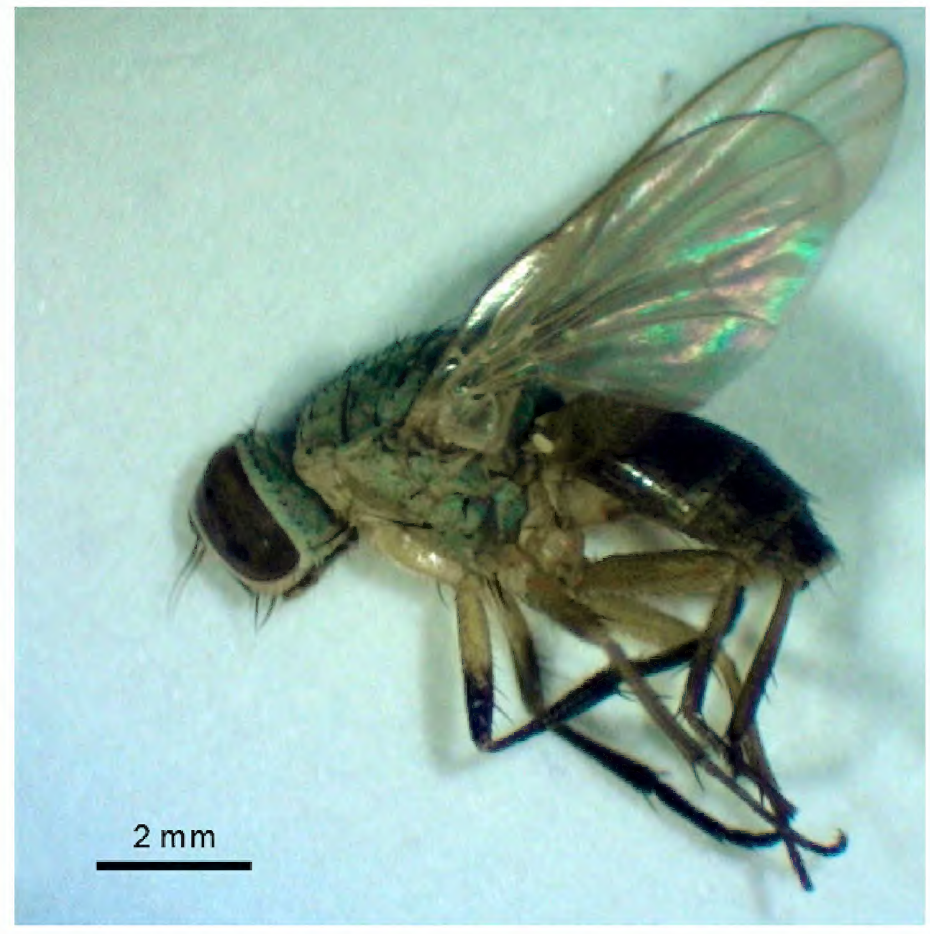

Figure 2. Male of *Atherigona reversura*, lateral view, from Pando, Canelones department (−34.7091. −055.9746), Uruguay.

Figure 3. Male of *Atherigona reversura*, lateroventral view of trifoliate process; from Pando, Canelones department (−34.7091, −055.9746).

angular head, with a long very sunken face and antennal postpedicel almost reaching lower facial margin in lateral view; arista bare; thoracic setae very reduced in size, prealar absent, acrostichal setae 0+1; katepisternals setae 1+2, lower one weaker, equidistant from the upper two; wing veins, except costa, bare; hind tibia without posterodorsal seta (calcar). Male and female have hyaline wings, a gray thorax, and a yellow abdomen with at least one pair of black spots. Female can be distinguished from male due to its longer and sharper abdomen in contrast to the male's which is short and round (Pont and Magpayo 1995).

Adult males and females have hyaline wings with the r-m cross vein in the basal half of the dm cell and before the intersection of the subcostal vein in the costal vein. Gray thorax and yellow abdomen with at least a couple of black spots. Males can be recognized by the bicolor frontal palp with enlarged tip, tarsomeres with elongated hairs, and genitalia with a trifoliate process present (Fig. 3).

Discussion

Knutson and Forrest (2019) showed that the lesions formed by larvae of *A. reversura* in Bermudagrass significantly impact the performance of this plant. Currently, there are no recommended sampling methods to evaluate the presence and abundance of *A. reversura* larvae in crops and forage (; Baxter et al. 2014).

Our study documents the first records of *A. reversura* in Uruguay and contributes to the expands the known geographical distribution of this species in South America. Studies of this kind, as well as those of Patitucci et al. (2016) in Argentina and Ribeiro et al. (2016) in Brazil, contribute important information useful in the control of this pest in the region. We encourage South American countries to monitor this species carefully because of its importance as an agricultural pest.

Authors' Contributions

All authors contributed to the writing of the article. MRDL collected the specimens. LDP and MRDL identified the species. MRDL took the photographs. LDP and EM reviewed the document.

Acknowledgements

We thank the Basic Sciences Education Program for financial support to MRDL and the reviewers for their valuable contributions.

References

Baxter LL, Hancock DW, Hudson WG (2014) The Bermudagrass Stem Maggot (*Atherigona reversura* Villeneuve): a review of current knowledge. Forage & Grazinglands 12 (1): 1–8. https://doi.org/10.2134/FG-2013-0049-RV

de Carvalho CJB, Couri MS, Pont AC, Pamplona D, Lopes SM (2005) A catalogue of the Muscidae (Diptera) of the Neotropical region. Zootaxa 860: 1–282. https://doi.org/10.11646/zootaxa.860.1.1

Cumming JM, Wood DM (2017) Adult morphology and terminology. In: Kirk-Spriggs AH, Sinclair BJ (Eds.) Manual of Afrotropical Diptera, volume 1. Introductory chapters and keys to Diptera families. Suricata 4. South Africa National Biodiversity Institute, Pretoria, South Africa, 89–133.

Grzywacz A, Pape T, Hudson WG, Gomez S (2013) Morphology of immature stages of *Atherigona reversura* (Diptera: Muscidae), with notes on the recent invasion of North America. Journal of Natural History 47 (15–16): 1055–1067. https://doi.org/10.1080/00222933.2012.742244

Heuzé V, Tran G, Delagarde R, Lebas F (2015) Bermudagrass (*Cynodon dactylon*). Feedipedia, a programme by INRA, CIRAD, AFZ and FAO. https://www.feedipedia.org/node/471. Accessed on: 2020-06-27.

Hudson W (2010) New exotic invasive fly found damaging Bermudagrass forage crops in Georgia. Athens (GA): University of Georgia College of Agricultural and Environmental Sciences. http://apps.caes.uga.edu/impactstatements/index.cfm?referenceInterface=IMPACT_STATEMENT&subInterface=detail_main&PK_ID=3278. Accessed on: 2020-10-30.

Knutson A, Forrest M (2019) Economic injury level for Bermudagrass Stem Maggot (Diptera: Muscidae) in Bermudagrass forage production in Texas. Journal of Economic Entomology 112 (5): 2215–2221. https://doi.org/10.1093/jee/toz153

McCullers JT (2012) Sampling techniques and population estimation for *Atherigona reversura* Villenueve (Diptera: Muscidae) in Bermudagrass hay fields. Master's thesis, University of Georgia, Athens, USA, 42 pp.

Oliveira MA, Pereira OG, Gomide JA, Huaman CAM, Garcia R, Cecon PR (2000) Análise de crescimento do capim bermuda 'Tifton 85' (*Cynodon* spp.). Revista Brasileira de Zootecnia 29 (6, supplement 1): 1930–1938.

Patitucci LD, Dufek MI, Mulieri PR (2016) First reports of the invasive pest Bermudagrass Stem Maggot, *Atherigona reversura* Villeneuve, 1936 (Diptera: Muscidae), in South America. Check List 12 (4): 1–5. https://doi.org/10.15560/12.4.1928

Pravia MV (2009) Use of precision agriculture elements and models of simulation for the incorporation of the space-temporary dimension in the research of agricultural crops. Master's thesis, University of the Republic, Montevideo, Uruguay, 133 pp.

Pont AC, Magpayo FR (1995) Muscid shoot-flies of the Philippine Islands (Diptera, Muscidae, genus *Atherigona* Rondani). Bulletin of Entomological Research Supplement Series 3: 1–123. https://doi.org/10.1017/S1367426900000321

Ribeiro LP, Menezes Netto AC, Jochims F, Haseyama KLF, de Carvalho CJB (2016) First record of *Atherigona reversura* Villeneuve (Diptera: Muscidae) feeding on Bermudagrass (*Cynodon dactylon* cv. Jiggs, Poaceae) in Brazil: morphological and molecular tools for identification. Revista Brasileira de Entomologia 60 (3): 270–274. https://doi.org/10.1016/j.rbe.2016.04.001

Rodrigues LRA, Rodrigues TJD, Reis RA, Soares-Filho CV (2006) Avaliacão de características fisiológicas de cinco cultivares de *Cynodon*. Acta Scientiarum. Animal Science 28 (3): 245–250. https://doi.org/10.4025/actascianimsci.v28i3.36

Savage J (2016) First Canadian record of the Bermuda Grass Stem Maggot, *Atherigona reversura* (Diptera: Muscidae). Journal of the Entomological Society of Ontario 147: 3–6.

Skidmore P (1985) The biology of the Muscidae of the world. Series Entomologica 29: 1–550.

Schiner JR (1868) Diptera. In: Wüllerstorf-Urbair B (Ed.) Reise der österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859, unter den Befehlen des Commodore B. von Wüllerstorf-Urbair. Zoologischer Theil, 2. Gerold's Sohn, Vienna, Austria, 1–388.

Villeneuve J (1936) 52. Diptera, 16. Muscidae. In: Hedin S, Ping-Chang S (Eds.) Schwedisch-chinesische wissenschaftliche Expedition nach den nordwestlichen Provinzen Chinas. Arkiv för Zoologi 27A (34). Almqvist & Wiksells Boktryckeri, Stockholm, Sweden, 1–13.